

REMARKS

This is a response to the Office Action dated April 2, 2002. Claims 7-11 and 21-47 are pending in the present application. Claims 21-47 have been allowed.

Reconsideration and allowance of pending claims 7-11 in view of the following remarks are requested.

The Examiner has rejected claims 7, 10, and 11 under 35 USC 102(e) as being anticipated by U.S. patent number 6,146,959 to DeBoer et al ("DeBoer"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by independent claim 7, is patentably distinguishable over DeBoer.

The present invention, as defined by independent claim 7, teaches a capacitor comprising a ceramic tantalum nitride dielectric situated between a first capacitor electrode and a second capacitor electrode. As disclosed and taught in the present application, ceramic tantalum nitride is a form of tantalum nitride in an amorphous ceramic mode. The fabrication of ceramic tantalum nitride, as disclosed in detail in the present application, results in a form of tantalum nitride exhibiting different properties than the well-known form of tantalum nitride fabricated in the metallic mode. For example, in the ceramic mode, tantalum nitride exhibits a high dielectric constant, which allows the present invention to utilize fabricated ceramic tantalum nitride as a dielectric to advantageously achieve a capacitor having a relatively high capacitance density. See, for example, page 12, lines 6-11 in the present application. Furthermore, as disclosed in the present application, the present invention's capacitor can be advantageously fabricated in

a single ionized metal plasma ("IMP") tool without having to remove the semiconductor wafer from the IMP tool for fabrication of a dielectric layer comprising ceramic tantalum nitride.

In contrast, DeBoer does not teach, disclose, or suggest a capacitor comprising a ceramic tantalum nitride dielectric. DeBoer is directed to a capacitor utilizing tantalum pentoxide as a dielectric. DeBoer specifically discloses first tantalum-comprising layer 38 preferably comprising Ta_2O_5 , i.e. tantalum pentoxide. See, for example, DeBoer, column 3, lines 62-64. DeBoer further discloses second tantalum-comprising layer 40, which is a barrier layer preferably comprising tantalum and nitrogen, formed over first tantalum-comprising layer 38. See, for example, column 4, lines 5-9 and Figure 3 of DeBoer. Thus, in DeBoer, tantalum and nitrogen, e.g. Ta_2N or $Ta_xO_yN_z$, are utilized to form a barrier layer, i.e. second tantalum-comprising layer 40, and not a dielectric layer. In DeBoer, metal nitride layer 42 is formed over second tantalum-comprising layer 40. See, for example, column 4, lines 65-66 and Figure 4 of DeBoer.

In DeBoer, metal nitride layer 42 can be formed by a conventional CVD process. Thus, in DeBoer, second tantalum-comprising layer 40 advantageously prevents carbon present from the CVD process from diffusing into first tantalum-comprising layer 38. See, for example, DeBoer, column 5, lines 3-9. Thus, DeBoer teaches a barrier layer comprising tantalum and nitrogen, i.e. second tantalum-comprising layer 40, protecting a dielectric made from tantalum pentoxide, i.e. first tantalum-comprising layer 38, from carbon diffusion resulting from the formation of metal nitride layer 42 by a CVD process.

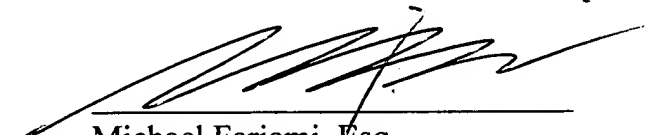
In a second embodiment, DeBoer also teaches use of second tantalum-comprising layer 40 as a barrier layer between second capacitor plate 50 and the Ta₂O₅ of layer 38 to prevent undesirable formation of silicon dioxide. See, for example, column 5, lines 15-24 and Figure 5 of DeBoer. For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by independent claim 7, is not suggested, disclosed, or taught by DeBoer. As such, the present invention, as defined by independent claim 7, is patentably distinguishable over DeBoer.

The Examiner has further rejected claims 8 and 9 under 35 USC 103(a) as being unpatentable over DeBoer in view of U.S. patent number 5,170,318 to Catala et al ("Catala"). As discussed above, independent claim 7 is patentably distinguishable over DeBoer and, as such, claims 8 and 9 are, a fortiori, also patentably distinguishable over DeBoer. Moreover, the features of independent claim 7, for example a dielectric comprising ceramic tantalum nitride situated between a first and second capacitor electrode, are not suggested, disclosed, or taught anywhere in Catala. As such, independent claim 7 as well as claims 8 and 9 depending therefrom are also patentably distinguishable over DeBoer in combination with Catala.

Based on the foregoing reasons, the present invention, as defined by independent claims 7 claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 7-11 pending in the present application are patentably distinguishable over the art cited by the Examiner. For all the foregoing reasons, an early notice of allowance covering the already allowed claims 21-47 as well as pending claims 7-11 is respectfully requested.

Respectfully Submitted,
FARJAMI & FARJAMI LLP

Date: 7/25/02

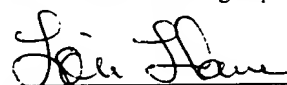

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